appeared and navigation opened. Harbor Springs, Mich., 20th, ice passed out of bay; 24th, harbor clear of ice; 25th, harbor and bay frozen over. Milwaukee, Wis., 12th, navigation opened. Green Bay, Wis., 8th, river clear of ice; 11th, the bay is clear of ice; 31st, first boat arrived, opening navigation.

Lake Ontario.—Oswego, N. Y., 30th, the schooner *Julia*, from Kingston, Ont., arrived to-day and opened navigation for the season.

Lake Superior.—Two Harbors, Minn., 16th, the harbor of the lake practically clear of ice at this point.

OBSERVATIONS ON THE GREAT LAKES.

Owing to the close of navigation on the Great Lakes during the winter season the Weather Bureau has received no reports from vessels for the month of March, and from only one U. S. Life-Saving station.

SUNSHINE AND CLOUDINESS.

SUNSHINE.

During the month an instrumental record of the amount of sunshine has been kept at 15 stations by means of the photographic sunshine recorder and at 21 stations by means of the thermometric sunshine recorder; the results of these observations are given in Table IV, which shows the actual percentage of sunshine received on the average of the month for any hour of local mean time (not seventy-fifth mean time).

The stations recording the largest percentage of sunshine between the hours of 11 a. m. and 1 p. m., are: Colorado Springs, Colo., 86.0; Denver, Colo., 82.5; Detroit, Mich., 81.5; Dodge City, Kans., 81.0; Key West, Fla., 86.5; Saint Louis, Mo., 86.5; Santa Fe, N. Mex., 81.5; Vicksburg, Miss., 86.0.

The stations having the least percentage during these hours, are: Portland, Oreg., 23; Cleveland, Ohio, 54; Cincinnati, Ohio, 55.

The general average sunshine for the whole month is given in the next to the last column of Table IV. The highest percentages are: Key West, Fla., 82; Santa Fe, N. Mex., 77; St. Louis, Mo., 75; Dodge City, Kans., Denver, Colo., and Tucson, Ariz., 74; Kansas City, Mo., 70. The lowest percentages are: Portland, Oreg., 24; Salt Lake City, Utah, 53; Chicago, Ill., 52; Buffalo, N. Y., 53; Galveston, Tex., 54; New Orleans, La., 55.

CLOUDINESS.

The number of clear and cloudy days and the average cloudiness between sunrise and sunset, as based on numerous personal observations, are given for each Weather Bureau station in Table I. The complement of this average cloudiness gives the observer's estimated percentage of clear sky, and these latter numbers are given in the last column of Table IV. On the average these personal estimates of clear sky are lower by about 8 per cent than the sunshine as recorded by the thermometric registers and lower by 11 per cent than the sunshine recorded by photographic registers.

GENERAL REMARKS.

The quantity of direct sunshine received at any station is approximately shown by the self-recording sunshine registers which work either by photography or by thermometry. The quantity of direct sunshine, or blue sky light, received at the same station is approximately shown by the estimated cloudiness, and the complement of this number is an approximate value of the average amount of sunshine received by the surrounding country, as distinguished from the station itself. As has been explained in previous WEATHER REVIEWS there is no necessary agreement between the local sunshine register and the observer's estimate of the cloudiness of the sky. In the following table there are brought together, side by side, the instrumental records of the percentage of duration of sunshine and the observer's personal estimate of the percentage of area of the sky covered by clouds, and, in accord with the results of previous months, it is seen that the differences are rather larger for comparatively clear skies but smaller for cloudy skies:

Difference between instrumental and personal observations of sunshine.

Station.	Photographic register.			Station.	Thermometric register.		
	Instrumental.	Personal.	Difference.		Instrumental.	Personal.	Difference.
Santa Fe, N. Mex.	77	63	14	Key West, Fla	82	62	20
Dodge City, Kans	74	62	12	St. Louis, Mo	75	64	11
Tucson, Ariz	74	59	15	Colorado Springs, Colo.	68	50	18
Denver, Colo	74	49	25	Philadelphia, Pa	68	47	21
Kansas City, Mo	70	65	5	Vicksburg, Miss	66	65	1
Savannah, Ga	69	60	9	Baltimore, Md	66	57	9
Washington, D. C	63	60	3	Detroit, Mich	66	45	21
Memphis, Tenn	61	58	3	Columbus, Ohio	64	45	19
Cleveland, Ohio	59	45	14	Wilmington, N. C.	62	64	— 2
San Francisco, Cal	57	53	4	Des Moines, Iowa	62	51	11
Cincinnati, Ohio	56	51	5	Portland, Me	62	45	17
Galveston, Tex	54	54	0	New Haven, Conn	61	40	21
Portland, Oreg	24	25	— 1	Louisville, Ky	60	47	13
Eastport, Me	.....	35	.....	New York, N. Y	60	46	14
San Diego, Cal	.....	62	.....	Little Rock, Ark	60	45	15
				Boston, Mass	60	41	19
				New Orleans, La	55	54	1
				Salt Lake City, Utah	53	40	13
				Buffalo, N. Y	53	39	14
				Chicago, Ill	52	51	1
				Rochester, N. Y	.....	41	.....

NOTES BY THE EDITOR.

OLD RECORDS OF COLD WEATHER IN MARCH IN MARYLAND.

In connection with the disastrous cold weather of the latter part of March, the voluntary observer, Mr. A. E. Acworth, of Mardela Springs (formerly Barren Creek Springs), Wicomico Co., Md., communicates the following extracts from old records kept by the late Dr. Ker, at Princess Anne, Somerset Co., Md., from 1823 to 1849, which show the dates in March of each successive year on which temperature fell to 32°, or below, also the recorded temperature itself in degrees; the dates on which frost, ice, or snow occurred are also given:

1823.—Temperature, 1st, 24; 4th, 28. Frost, 9th, 26th. Snow, 2d.

1827.—Temperature, none. Frost, 31st.

1830.—Temperature, 10th, 32. Frost, 5th, 10th, 20th.

1831.—Temperature, 18th, 32; 21st, 32. Frost, 2d, 8th, 9th, 11th, 22d. Snow, 17th.

1832.—Temperature, 15th, 30; 16th, 32; 18th, 23–24; 19th, 26. Frost, 2d, 16th, 28th, 29th, 31st.

1834.—Temperature, 23d, 32. Frost, 14th, 17th, 31st. Ice, 31st. Snow, 3d.

1836.—Temperature, 3d, 29–30; 12th, 30–31; 13th, 28–29; 16th, 32; 26th, 32. Frost, 4th, 9th, 13th, 16th, 25th, 27th. Snow, 22d.

1837.—Temperature, 1st, 31; 4th, 22; 5th, 27–28; 6th, 31. Frost, 12th, 17th, 21st. Snow, 3d, 24th.

1838.—Temperature, 1st, 26; 3d, 30; 4th, 31. Frost, 13th, 24th. Snow, 2d.

1840.—Temperature, 11th, 32; 12th, 31; 26th, 32. Frost, 6th, 26th. Ice, 6th, 22d.

1841.—Temperature, 15th, 30; 17th, 28; 18th. 28. Frost, 4th, 24th. Snow, 5th, 17th, 18th.

1842.—Temperature, none. Frost, 15th, 16th.

1843.—Temperature, 2d, 28; 3d, 22; 4th, 24; 5th, 29; 6th, 26; 7th, 28; 8th, 28; 14th, 29; 18th, 30; 19th, 28; 20th, 29; 21st, 31; 23d, 31; 24th, 21; 25th, 28; 26th, 32; 27th, 32. Frost, 22d, 30th. Snow, 17th.

1844.—Temperature, 5th, 32; 6th, 30; 19th, 32. Frost, 6th, 12th. Snow, 31st.

1846.—Temperature, 1st, 32; 3d, 26; 4th, 22. Frost, 11th, 22d, 31st. Snow, 2d.

1847.—Temperature, 17th, 30 (Manokin River frozen over). Frost, 6th, 15th, 19th. Snow, 13th, 27th.

1848.—Temperature, 4th, 31; 6th, 26; 15th, 26; 16th, 22; 17th, 30. Frost, 25th.

1849.—Temperature, none. Frost, 23d.

Mr. Acworth also communicates the following extracts from his own records for Mardela Springs, Wicomico Co., Md. According to his maximum and minimum thermometer the temperature fell to 32°, or below, as follows:

1889.—Temperature, 1st, 30; 2d, 31; 10th, 32; 11th, 32; 12th, 25; 23d, 26th, and 29th, 30; 30th, 32; 31st, 31. Frost, 1st, 2d, 12th, 13th, 18th, 23d, 28th, 29th. Snow, 21st, 29th.

1890.—Temperature, 1st, 31; 2d, 25; 3d, 20; 4th, 24; 5th, 31; 6th, 23; 7th, 13; 8th, 24; 9th, 19; 10th, 20; 16th, 24; 17th and 20th, 28; 24th, 30. Frost, 4th, 10th, 20th. Snow, 1st, 2d, 3d, 6th, 15th.

1891.—Temperature, 1st, 25; 2d, 26; 5th and 6th, 29; 14th, 30; 15th, 27; 17th, 30. Frost, 6th, 11th, 18th, 29th, 30th, 31st. Ice, 26th, 29th. Snow, 28th.

1892.—Temperature, 1st, 31; 2d, 26; 4th, 25; 7th, 21; 11th, 20; 12th, 23; 13th and 14th, 25; 15th, 24; 16th, 22; 17th, 19; 18th, 29; 19th, 24; 20th, 30; 21st, 23; 22d, 17; 30th, 29. Frost, 22d, 25th. Snow, 2d, 11th, 18th.

1893.—Temperature, 1st, 32; 5th, 15; 6th, 16; 7th, 27; 8th, 23; 13th, 32; 15th, 30; 16th, 22; 17th, 21; 18th, 29; 19th, 31; 27th and 28th, 26; 29th, 30. Frost, 1st, 2d, 4th, 8th. 13th, 17th, 27th, 29th, 30th. Ice, 29th. Snow, 4th, 17th.

1894.—Temperature, 1st, 29; 2d, 29; 4th, 25; 13th, 32; 15th, 27; 26th, 29; 27th, 22; 28th, 16; 30th, 32. Frost, 1st, 2d, 4th, 13th, 15th, 17th, 24th, 28th. Ice, 27th, 28th, 30th. Snow, 25th.

OBSERVATIONS AT HONOLULU, HAWAIIAN ISLANDS.

Meteorological observations at Honolulu, Hawaiian Islands, for March, 1894, by Curtis J. Lyons, Meteorologist to the Government Survey.

Date.	Barometer at sea level.			Temperature.					Humidity.			Wind.		Rain to 6 p. m.
									Relative.					
	9 a. m.	3 p. m.	9 p. m.	6 a. m.	2 p. m.	9 p. m.	Minimum.	Maximum.	9 a. m.	9 p. m.	Absolute.	Direction.	Force.	
	Ins.	*Ins.*	*Ins.*	°	°	°	°	°	*Pr. ct.*	*Pr. ct.*				*Ins.*
1.....	30.20	30.13	30.20	69	72	71	65	74	75	75	6.3	ne.	4	0.66
2.....	30.21	30.15	30.23	71	75	70	69	77	70	74	6.1	ne.	5	0.22
3.....	30.24	30.17	30.26	71	75	72	68	76	70	70	6.1	ne.	5	0.05
4.....	30.26	30.17	30.22	70	75	69	69	76	67	77	5.9	e., ne.	5	0.03
5.....	30.24	30.15	30.20	69	75	72	69	76	70	70	6.0	ne.	5	0.01
6.....	30.24	30.16	30.23	70	74	71	70	75	67	62	5.5	ne.	5, 6	0.05
7.....	30.25	30.19	30.26	70	73	71	69	74	73	66	5.7	ne.	5, 6	0.00
8.....	30.24	30.17	30.22	70	74	70	67	75	74	74	5.8	ne.	5, 6	0.35
9.....	30.20	30.10	30.18	67	75	69	66	75	66	70	5.7	ne.	5	0.25
10.....	30.12	30.06	30.14	68	74	70	68	74	67	77	5.8	ne.	5	0.00
11.....	30.11	30.04	30.11	69	74	71	68	76	66	69	5.8	ne.	5	0.01
12.....	30.10	30.06	30.14	68	74	71	66	77	67	73	6.1	ne.	4	0.33
13.....	30.15	30.08	30.16	70	75	72	68	76	70	72	6.1	ne.	5	0.20
14.....	30.18	30.08	30.18	69	77	71	68	78	70	72	6.1	ne.	5	0.11
15.....	30.18	30.09	30.17	70	76	72	69	77	67	74	6.2	ne.	4	0.05
16.....	30.18	30.11	30.16	70	77	72	67	79	66	77	6.7	ne., s.	3, 0	0.28
17.....	30.13	30.05	30.13	64	76	68	64	81	70	87	6.5	n., s.	1	0.03
18.....	30.11	30.04	30.11	64	76	70	63	79	75	85	6.8	n., s.	1, 0	0.00
19.....	30.12	30.05	30.08	67	76	72	66	77	72	77	6.7	s., e.	1	0.00
20.....	30.10	30.00	30.06	68	73	68	68	77	77	89	6.8	n., ne.	1, 4	0.01
21.....	30.12	30.04	30.11	67	72	68	66	73	79	67	5.9	n., ne.	4, 6	0.05
22.....	30.16	30.09	30.16	67	70	66	65	73	55	55	4.2	n., ne.	5, 3	0.00
23.....	30.11	30.02	30.06	65	73	67	65	73	58	66	4.6	n.	3	0.00
24.....	29.98	29.90	29.99	64	70	62	63	75	63	85	5.2	n., w.	1	0.00
25.....	29.99	29.92	30.04	58	72	62	56	75	63	79	5.0	nw., sw.	1	0.03
26.....	30.04	29.98	30.04	62	72	68	60	75	69	71	5.6	sw., e.	2	0.03
27.....	30.07	30.03	30.13	65	75	69	62	76	65	64	5.4	ne.	3	0.03
28.....	30.16	30.10	30.18	65	75	70	64	77	69	68	5.7	ne.	4	0.01
29.....	30.22	30.14	30.23	68	75	71	66	78	57	62	5.5	ne.	3	0.00
30.....	30.22	30.14	30.22	69	72	69	68	77	69	75	5.7	ne.	3	0.00
31.....	30.20	30.10	30.16	69	75	71	66	77	65	66	5.7	ne.	3	0.06
	30.156	.....	30.154	67.6	74.1	69.5	66.1	76.1	68.0	72.4	5.8			2.91

The barometer is corrected for temperature and reduced to sea level, but the gravity correction, —0.06, is still to be applied.

The absolute humidity is expressed in grains of water, per cubic foot, and is the average of four observations.

The rain is measured at 6 p. m., daily.

NOTE.—This table was received too late to be quoted in the chapter on "Atmospheric pressure."

TORNADO CLOUD OF MARCH 4, 1894.

Dr. J. C. Neal, Director of the Experiment Station at Stillwater, Okla., and formerly resident first in Indiana and afterward in Florida, states that he desires to—

Call attention to a peculiar cloud formation that I have noted for some years as prognostic of these dreadful storms, and that I think may be relied upon as invariably present from thirty minutes to two hours before the tornado.

The peculiar cloud is characterized by ball-like masses of a light gray or white color, often in long lines on a darker background or in clumps, often three or more side by side, the under side circular, the upper indefinite or shading into the main cloud. At times this gives it the appearance of having scallops, or a shell-like edge, when the tufts are at the lower margin of the cloud. An hour before the terrible tornado of April 25, 1893 (near Stillwater, Okla.), these tufts covered the sky, arranged in long lines, the under side perfectly round, the upper streaming out like cotton balls partially unwound.

With every tornado that has visited this section, or that has occurred within 150 miles of Stillwater, this phenomenon has been seen for the last four years, and in Indiana I have seen it for thirty years, so that it has the elements of constancy.

As it is impracticable to republish, in this REVIEW, the diagram that accompanied the textual description of Dr. Neal, it may be described as follows: This sketch shows the appearance of a distant tornado whirl and of the under surface of the clouds as seen between 4 and 5 p. m., seventy-fifth meridian time, March 4, 1894, from a point near Stillwater, Okla. The observer is looking toward the east and a tornado is in progress some distance away in the center of the field of the sketch. The wind at the observer's station is from the southwest, at a rate of from 45 to 60 miles per hour. In addition to the great conical cloud reaching down toward the earth from the under surface of a general layer of clouds, the diagram shows that on either side of that whirl to the right and left, and especially on the westward, or the observer's side, the under surface of the cloud layer is thickly studded with what is known in the English cloud nomenclature as "mammiform" clouds, otherwise called mammoid, mammato-cumulus, globo-cumulus, pocky cloud, rainballs, or festooned cumulus.

A mammiform cloud is supposed to mark the central region of a comparatively small whirling mass of air, such as might, under favorable circumstances, develop into a waterspout or tornado. Such cloud formations have, hitherto, always been recorded in Europe and America in connection with northwest winds, or in the narrow border line where southwest winds are about to be replaced by northwest winds. It is, however, remarkable that Dr. Neal has recorded a case in which southwest winds and mammiform clouds were prevailing on the west side of a tornado, as this is contrary to the ordinary distribution of winds and clouds around a cyclonic whirl.

In a subsequent letter Dr. Neal states:

From 2 p. m. (seventy-fifth meridian time), March 4, the wind blew a steady gale from 45 to 60 miles per hour until after 8 p. m.

Rain, with hail and sleet, fell from 5 p. m. till nearly 11. I first noted the "mammiform" (mammoid?) clouds about 1.30 p. m. and called the attention of some of my staff to the peculiar look, and told them that these clouds meant mischief. At 4 p. m., the appearance was as shown in the sketch; the nearest point of the storm was 4 miles. The wind at no time was from the northwest that night. Later on, about 9 p. m., as you will see by the inclosed clipping, another tornado began near Tecumseh, Okla. [100 miles south of Stillwater], which reminds one of the storm of April 25, 1893, when two tornadoes passed over this territory, one passing 7 miles south of Stillwater, the other, later on, passing near Moore and Norman.

I shall make these storms an especial study this year, but I am convinced that these peculiar storm clouds are a sure sign of tornadoes, and that in some way, this information should have the widest circulation possible in the storm belt.

You will see that in all these instances the storms passed to the eastward of a line drawn north and south of Stillwater. I hope to get photographs of some of these "whirls" if they come my way, which, however, I do not care to investigate at too close a range.

The newspaper clipping above referred to is an extract from the "Tecumseh Herald" of March 10, 1894, according

to which, on Sunday evening, March 4, about 8 p. m., a black cloud approached Tecumseh from the west and at a point 1 mile north of the town:

A small twister, in the shape of a funnel, dipped to the ground and did some damage. It then proceeded northeasterly, and another funnel-shaped cloud came up from the west and the two met a short distance northeast of Shawnee, and much damage was done at a point about 9 miles northeast of Tecumseh.

THE METEOR OF MARCH 27 IN IOWA.

A bright meteor of the largest size and brightness passed from south to north, or possibly from southeast to northwest, about 8.15 p. m., central, or 9.15 p. m., eastern, time, on March 27, over the eastern portion of Iowa. The following is an abstract of the reports that have been received:

Iowa City.—The snow was falling, and on examination it was found that there was a layer of dust which was supposed to have come from the meteor. Amana.—At 8.15 p. m., central time, a large meteor passed from southeast to northwest, and a few minutes later the windows rattled with the report of an explosion. Marengo (11 miles west of Amana).—The light was as bright as daylight. The meteor passed overhead about 8.20 p. m., central time; two distinct detonations were heard; snow had begun to fall at 7.45 and continued all night. At a place 8 miles northwest of Marengo the ground was covered with a black dust that was mixed with the snow, and at Marengo itself there was also a layer of snow that when melted gave a dark liquid; the director of the Iowa State Weather Service obtained a sediment of fine sand of a brown ashy hue, apparently a mixture of silica and iron. Belle Plaine.—A brilliant meteor passed over us; snow was falling at the time mixed with fine dust, supposed to have come from the meteor. Cedar Rapids.—The meteor was seen. Monticello.—8.15 p. m., the weather was cloudy, but the meteor made it as bright as day. Postville.—The flash of the meteor was seen about 8 p. m., and afterward heard a low distant rumble like thunder.

Postville is about 63 miles north of Iowa City; Belle Plaine is about 25 miles west-northwest and Monticello about 30 miles north-northeast of Iowa City; the other stations are between these limits. The length of time that elapsed between the light and the sound, namely, a few minutes at Amana, shows that the meteor must have been at a considerable height, since sound travels at the rate of about 12 miles a minute and would first reach the observer from that point of the meteor's path that was nearest to him. The hypothesis that the dust that discolored the snow throughout this region came from the meteor is to be offset by the consideration that if an ounce of such dust could be gathered from a square rod of snow, as seems to have been the case, then the resulting size of the meteor that would thus cover a region 25 miles square would necessarily be about 1,200 tons, which is, of course, entirely out of the question, as very few meteors have ever exceeded a ton, and the brightest meteors are oftentimes stony masses of much smaller weight than this. During the afternoon and evening of the 27th a strong southerly wind, with clouds of dust, prevailed over Arkansas, Oklahoma, Missouri, Kansas, and parts of Iowa and sufficiently accounts for the dusty snow that was precipitated on the front of the cold wave that was then advancing from South Dakota into Kansas and Iowa.

OBSERVATIONS BY W. B. FEATHERSTONE, OF SAN FRANCISCO, CAL.

(1) *At sea.*—Sailing from San Francisco, Cal., September 18, 1893, we encountered northwesterly winds until October 1, with slowly rising barometer. The barometer was highest September 30, 1 a. m. (30.58 inches), in N. 43° 32′, W. 137°, and was unusually low on October 6, 10, 14, and 16, as follows:

October 6, 11 a. m., N. 48° 50′, W. 147° 20′, barometer 29.20, with violent southerly gale; before this the direction of the wind was variable and afterward from the west-northwest. The rainfall on the 5th was from 6 to 12 p. m., amounting to 0.10 or 0.20 of an inch.

October 10, 9 a. m., N. 52° 15′, W. 148°, barometer 29.00, wind half a gale from the north; before this it was from the northeast and afterward from west-northwest. Rain all day, total amount a trace.

October 14, 8 p. m., N. 53° 30′, W. 157° 40′, barometer 29.10, moderate gale from south-southwest; before this it was from the south-southeast and afterward from west-southwest. Rainfall at 4 p. m., a trace.

October 16, 11 a. m., N. 54° 40′, W. 160°, barometer 29.10, strong wind from north-northwest; before this it was from the north and afterward from northwest. Rainfall during the previous night, one inch of snow.

(2) *On Unga Island, Alaska, at the Camp of the Apollo Mining Company, half a mile west of Delarof Harbor (about N. 55° 10′, W. 160° 30′).*—November 2, 2.16 p. m.: A medium loud rumble of thunder is followed immediately by hail from west-southwest (magnetic). 2.19 p. m.: A faint flash of lightning is followed in two or three seconds by a lighter peal than before and a third light rumble about a minute later. Wind had been southwest to westerly during morning, with a clear sky, occasionally broken by nimbus, but no shower. It clouded dark and suddenly shortly after 2 p. m., and hail-rain fell till 4 p. m. in spasmodic showers like an eastern thunderstorm. This seems to be the only thunder ever heard on the island by any of the residents, some of them having lived there fifteen or twenty years. A few of the natives had been told of thunder during the Russian times but never heard any. Capt. J. W. Lenard tells me that he witnessed a genuine thunderstorm in Twelve Fathom Straits, off Simeonof Islands, in April, 1877, and that it was the only other one he ever saw or heard of in this part of the world.

November 13: There are about 20 inches of snow on the hills and in the more exposed valleys, and but 3 or 4 inches in the more sheltered parts, the rest having fallen as rain.

November 14: A gale set in from the southeast late in the afternoon, and increased to the violence of a hurricane during the night. The wind was about east or east-southeast (magnetic) during the strongest of the blow. 1.22 inches of rain fell, and the company's dam, just completed, was carried away. All the snow was melted save a few very small patches.

November 19: Obtained a view of the neighboring islands and mainland and saw that the snow had melted there also, and that the recent light snow (17th and 18th) had fallen only on parts of the other islands, while it nearly covered Unga.

1894, January 17 (perhaps 16): A light shock of earthquake at 3.50 a. m.; did not feel it myself; the only one I heard of during my stay.

February 22, 7.30 p. m.: The northern sky is very bright, and from here (Unga town) I see the top of a band of auroral light which, perhaps, rests on the horizon and extends at least 100° along the northern horizon (my view is restricted by hills which rise about 10°). Its outline is slightly curved, as it is 20° wide in the middle and but about 10° at the ends, where it gradually diffuses. 11 p. m.: The arch is not visible, but the northern sky is still very bright, even aside from the moon, which is now rising.

February 23, 4.30 a. m.: Parties going from town to camp say there was a momentary bright flash about this time. 7.30 p. m.: Walking from town to camp I see a faint hazy light slanting from the horizon at south 80° west (true) toward a little below Jupiter. It is triangular in form and perhaps 15° wide at the base, and extends about three-fourths of the distance to Jupiter and the Pleiades; its length, therefore, is about 40°. Its northern boundary seems a little better defined than the southern, but the whole is so very faint and diffuse that I can not set its limits within 5°. But for this, the western sky is scarcely brighter than the eastern (twilight having about ended), but the northern sky is very bright owing, doubtless, to auroral light. At Camp, 8.45 p. m.: Several streamers rise above a range of hills in the north and appear to radiate from the northern horizon. The positions (at 15° high) are, roughly, as follows: one 3° wide at 15° west (magnetic), another 2° wide at 5° west, and one 5° wide at 20° east, also several smaller ones. They kept varying in length and brightness, and by 9 p. m. have given way to a general glow. 9.15 p. m.: New streaks have appeared in different positions, and are smaller, brighter, and more numerous (8 or more). Most noticeable are the 5° streak seen before, just east of the radiating point, and another a little farther west of it and smaller. These are about 10° apart at 20° above the horizon and appear to radiate from a point on or below the horizon at 30° or 35° east of (true) north. The eastern edge of each streamer is better defined than the western. The changes are not very rapid and can all be followed by observing three or four times a minute. The longest streaks are traceable to a height of 40° or 45°. 10 p. m.: The northern sky is very much darker and no streamers apparent. A curious feature of these streaks was that the sharpest and brightest edge of each seemed to rise from some sharp irregularity in the outline of the range of hills which intercepted my view to the north. The difference in definition of the two edges may, then, have been an illusion. It is interesting to note that this, the only display seen here during the winter, nearly coincides with the meridian passage of a large sun spot, visible to the naked eye.